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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/080,913 | 02/21/2002 | Luu Thanh Nguyen | NSCIP131X1 | 1176 |
| 22434 | 7590 | 03/08/2007 | EXAMINER | |
| BEYER WEAVER LLP | | | FARAHANI, DANA | |
| P.O. BOX 70250 | | | ART UNIT | PAPER NUMBER |
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| SHORTENED STATUTORY PERIOD OF RESPONSE | | MAIL DATE | DELIVERY MODE | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| | | |
|------------------------------|-----------------|---------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/080,913 | NGUYEN ET AL. |
| | Examiner | Art Unit |
| | Dana Farahani | 2891 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 14 December 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 19-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 19-43 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) Notice of Informal Patent Application
- 6) Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 19, 20, 22-27, 33 and 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Kinsman et al., hereinafter Kinsman (US Patent Application Publication 2002/0027257).

Regarding claims 19, 24, 26, and 27, Kinsman discloses in figure 1, a flip chip integrated circuit having flip chip bond pads 12 with solder bumps 20 formed directly on active surface of the flip chip; and

A substantially uniform layer of underfill adhesive 30 applied directly on the active surface of the flip chip integrated circuit and around the solder bumps formed onto the active surface, the substantially uniform layer of underfill adhesive forming continuous cut edges around the periphery of the flip chip (see fig. 1D).

Regarding claim 20, the underfill adhesive includes a hardener (see paragraph 26).

Regarding claims 22 and 23, see figure 1C, wherein solder bumps are at least exposed through the underfill material, and figure 1B, that the height of the underfill ranges from 140% to 90% of the bumps.

Regarding claim 25, the underfill adhesive is epoxy (see above).

Regarding claim 33, a solder paste 32 is provided on the contact pads of the substrate.

Regarding claim 34, a fluxing material 30 is provided on the substrate.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 21 and 28- 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinsman.

Regarding claim 21, Kinsman discloses the claimed invention, as discussed above, except for expressly stating that the underfill adhesive has a coefficient of thermal expansion (CTE) substantially similar to that of the substrate. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the CTE's of the substrate and the chip similar to increase the reliability of the device.

Regarding claims 28-31, Kinsman discloses the claimed invention, as discussed above, except for expressly disclosing the underfill is substantially opaque with the claimed CET and elastic modulus. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the pre-cure height and other properties of the adhesive in accordance with the kind of adhesive that is available and also the environment in which the device is to be used.

5. Claims 35-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Capote (US Patent Application Publication 2002/0014703) in view of Pasadyn et al., hereinafter Pasadyn (US Patent 6,605,479).

Capote discloses the limitations in those claims, see the Office Action of 3/15/06, except for a wafer in which a plurality of die is formed on.

Pasadyn discloses that in the art such arrangement is normally made on a wafer to make various applications (see col. 1, lines 50-53). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make a plurality of die of the Capote reference on a wafer for various applications, while at the same time benefit from the properties associated with the flip chip of the Capote reference.

6. Claims 32 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinsman (claim 32), and Capote in view of Pasadyn (claim 43) as applied to claims 19 and 35 above, and further in view of Chiu et al., hereinafter Chiu (U.S. Patent 6,391,683).

Kinsman, and Capote in view of Pasadyn discloses the limitations in the claims, as discussed above, except for a dam around the periphery of the wafer.

Chiu discloses in figure 3C dam 111 around resin 141, and resin 141 is on substrate 110. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a dam in the structure of Kinsman in view of Pasadyn, on the substrate of the Kinsman reference, which would be on a wafer, to physically secure the underfill material.

Product-by-Process Limitations

While not objectionable, the Office reminds Applicant that “product by process” limitations in claims drawn to structure are directed to the product, *per se*, no matter how actually made. *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al.*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product *per se* which must be determined in a “product by process” claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in “product by process” claims or otherwise. Note that applicant has the burden of proof in such cases, as the above case law makes clear. Thus, no patentable weight will be given to those process steps which do not add structural limitations to the final product.

For example, in claim 24, the underfill adhesive layer is deposited on the active surface of the flip chip in wafer form before chip is singulated, is considered method of forming the chip and an intermediate product which does not add to the limitations of the final product. Also, in claim 22, the underfill deposited on the active surface of the flip chip at a pre-cured height.... Therefore, such limitations are given no patentable weight.

In claims 19 and 35, the reflowable underfill adhesive reflowing during solder reflow, is considered a process property of a middle product during the formation of the apparatus of the instant application, while the Kinsman reference discloses the final product, as discussed above.

Response to Arguments

7. Applicants' arguments filed on 12/14/06 with respect to the rejected claims have been considered. The newly added limitation that of the adhesive melting during the reflowing of solder is addressed in the product-by-process section.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (571)272-1706. The examiner can normally be reached on M-F 9:00AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571)272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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